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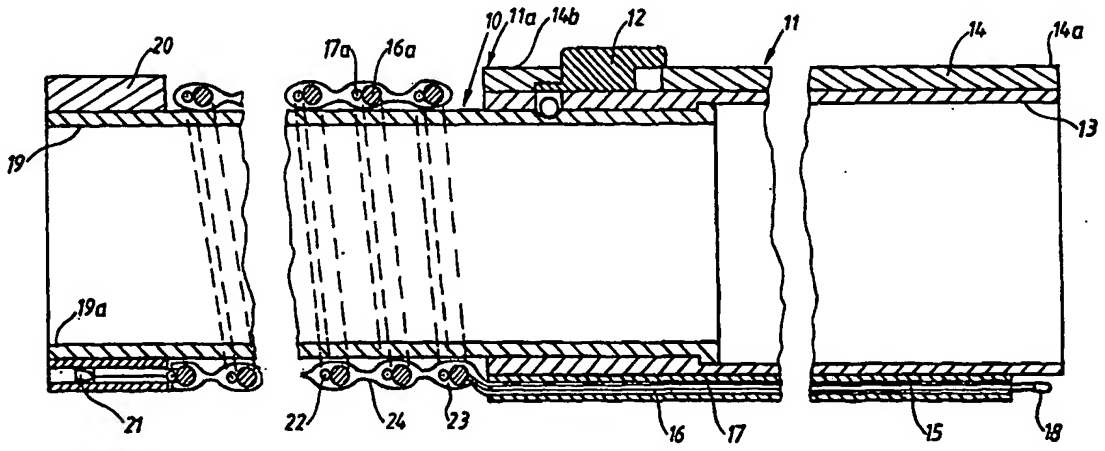

(57) Abstract

A telescopic tube shaft for a vacuum cleaner including an outer tube (11) which is slidably arranged on an inner tube (10). The outer tube encloses at least a part of an electric conductor (17) extending mainly between the upper and lower ends of the telescopic tube shaft. The conductor includes an electrical connector (18, 21) at the upper and lower ends of the telescopic tube shaft. A portion of the inner tube (10) is surrounded by a coil spring (16a) and the conductor (17) extends parallel to the spring (16a).

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TELESCOPIC TUBE SHAFT FOR A VACUUM CLEANER

The present invention relates to a telescopic tube shaft for a vacuum cleaner comprising an outer tube which is slidably arranged on an inner tube, the outer tube enclosing at least a portion of an electric conductor extending mainly between the two ends of the telescopic tube shaft and being provided with an electric connection means at the lower and upper ends of the telescopic tube shaft.

Such telescopic tube shafts are generally known, and are used to transmit electrical energy from the vacuum cleaner via a hose connected to the vacuum cleaner and a tube handle to a nozzle connected to the telescopic tube shaft. The nozzle comprises a brush roll driven by an electric motor, or other electric equipment. Such telescopic tube shafts are, for instance, described in DE 4404394 and US 4319380. In order to permit lengthening or shortening of the tube shaft, the conductor is usually spirally wound and placed within a protective elongated pocket arranged on the outside of the tube or between the two tubes. This, however, means that the manufacturing process becomes complicated which means that the tube shaft becomes relatively expensive.

The present invention is directed toward a telescopic tube shaft which is simpler and, hence, cheaper to manufacture and which incorporates a conductor therein.

In accordance with the present invention, a telescopic tube shaft for a vacuum cleaner includes an outer tube which is slidably arranged on an inner tube. The outer tube receives at least a portion of an electric conductor. The tube shaft has an upper end and a lower end, and the conductor extends between the upper and lower tube shaft ends. The tube shaft upper end includes a first electric connection means and the tube shaft lower end includes a second electric connection means. A portion

of the inner tube is surrounded by a coil spring and the conductor extends spirally and generally parallel to the coil spring.

In further accordance with the present invention, the conductor is electrically insulated from the spring, and the spring and conductor are surrounded by an insulating cover. The insulating cover includes bridge-shaped flexible parts connecting adjacent winds of the cover.

These and further features of the present invention will be apparent with reference to the following description and drawings, wherein:

FIG. 1 is a vertical section through a device according to the present invention;

FIG. 2 is an enlarged cross-sectional view of a part of the device shown in FIG. 1; and,

FIG. 3 is an enlarged cross-sectional view of a second, alternative embodiment of the present invention.

With reference to FIG. 1, a telescopic tube shaft according to the present invention is shown to include an inner tube 10 and an outer tube 11. The inner tube 10 is slidably arranged within the outer tube 11. The inner and outer tubes 10, 11 can be releasably secured to each other in a desired extended position by operation of a locking means 12.

The outer tube 11 has an inner tube part 13 and an outer tube part 14. The outer tube part 14 encloses a cable 15 having two or more flexible conductors 16, 17. The cable 15 extends axially through a passageway formed in the outer tube part 14 between upper and lower ends 14a, 14b of the outer tube part 14. At the upper free end of the telescopic tube shaft the cable is connected to a first connection means 18. The connection means 18 is designed as a male connector which is adapted to be connected to a corresponding female connector on a tube handle (not shown) arranged on a hose connecting the tube handle with the vacuum cleaner or, alternatively, directly with the vacuum cleaner for a hand held vacuum cleaner.

The inner tube 10, which is preferably made of plastic, comprises a tube shaped body 19 supporting a sleeve 20 arranged at a lower portion 19a of the telescopic tube shaft. The sleeve 20 is provided with a connection means 21 designed as a female connector facing the lower end of the telescopic tube shaft and being intended to cooperate with a corresponding male connector on a nozzle (not shown), which is, for instance, provided with a brush roll driven by an electric motor. The conductors 16, 17 extend axially through the sleeve 20, and the connection means 21 is connected to the lower ends of the conductors 16, 17. Preferably, the sleeve 20 is fixed to the tube-shaped body 19. Alternatively, the sleeve 20 may be slidably secured to the tube-shaped body 19 and retained in a suitable position by means of frictional forces or mechanical holding means.

The conductors 16, 17 are, in an area between the sleeve 20 and a lower end 11a of the outer tube 11, spirally wound about the inner tube 10. Preferably, at least a part 16a of one of the conductors 16 is shaped as a coil spring made from a comparatively thick metal thread, as illustrated. The spirally wound part 17a of the other conductor 17, which preferably comprises several thin threads, is surrounded by an insulating layer 22 preventing the spirally wound parts 16a, 17a of the conductors 16, 17 from contacting each other.

The spirally-wound part 16a of the one conductor 16 and the insulating layer 22 are enclosed in a cover 23, preferably of plastic, which slides easily over the inner tube 10. The cover 23, via bridge-shaped flexible parts 24, connects adjacent winds of the conductors 16a, 17a which are concealed within the cover 23. The cover 23 has a freedom of movement with respect to the inner tube 10 to permit the cover to be pulled out or extended in a lengthwise direction and, with the sleeve 19, placed at the lower portion of the inner tube 10. Accordingly, the cover 23 may be elongated or retracted to accommodate relative movement between the inner and outer tubes 10, 11.

The embodiment shown in Fig. 3 comprises two conductors 25,

26 with surrounding insulating layers 28, 29 that are embedded in a plastic cover 30 together with a coil spring 31. The coil spring 31 can either serve as a third conductor, if necessary, or serve solely as a spring, if two conductors 25, 26 are sufficient. Naturally, it is within the scope of the invention to use any number of conductors together with the coil spring.

The built-in coil spring 31 causes even distribution of the spirally wound conductors 25, 26 over the area between the sleeve 20 and the lower end 11a of the outer tube 11 independently of the position of the inner tube 10 with respect to the outer tube 11, while the cover 30 protects the inner tube. It is also within the scope of the invention to eliminate the bridge-shaped parts 24 and, instead, make the spring 31 and the conductor or conductors 25, 26 as one single coil embedded in plastic.

By connecting the upper end of the telescopic tube shaft with the tube handle and the lower end of the tube shaft with an electrically driven brush roll nozzle, electrical energy can directly be transmitted from the household power outlet or socket via the vacuum cleaner to the brush nozzle.

CLAIMS

1. A telescopic tube shaft for a vacuum cleaner comprising an outer tube (11) which is slidably arranged on an inner tube (10), the outer tube receives at least a portion of an electric conductor (17), said tube shaft having an upper end and a lower end and said conductor extending between the upper and lower tube shaft ends, said tube shaft upper end including a first electric connection means (18) and said tube shaft lower end including a second electric connection means (21), **characterized in** that a portion of the inner tube (10) is surrounded by a coil spring (16a), said conductor (17) extending spirally and generally parallel to said spring (16a).

2. A telescopic tube shaft according to claim 1, **characterized in** that the spring (16a) is a portion of an additional conductor (16) which extends between said first and second connection means (18, 21).

3. A telescopic tube shaft according to claim 1 or 2, **characterized in** that the conductor (17) is electrically insulated from the spring (16a) and said spring and conductor are surrounded by an insulating cover (23).

4. A telescopic tube shaft according to claim 3, **characterized in** that the insulating cover (23) comprises bridge-shaped flexible parts (24) connecting adjacent winds of the cover.

5. A telescopic tube shaft according to claim 3 or 4, **characterized in** that the cover is made of plastic.

6. A telescopic tube shaft according to any of the preceding claims, **characterized in** that the first connection means (18) comprises a male connector and the second connection means comprises a female connector.

7. A telescopic tube shaft according to claim 6, **characterized in** that the inner tube (10) supports an outer sleeve (20) arranged at a lower part of the inner tube, said outer sleeve holding said female connector.

8. A telescopic tube shaft according to claim 7, **characterized in** that the outer sleeve is slidably received on the inner tube.

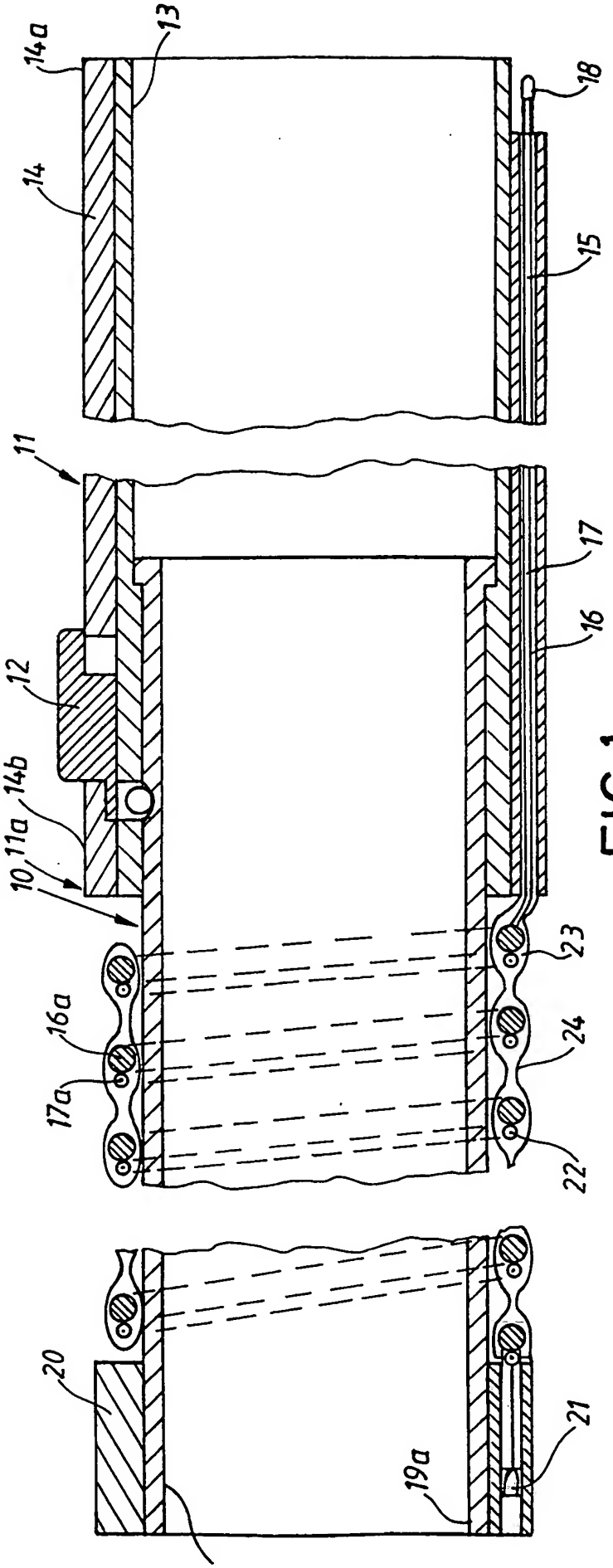

FIG.1

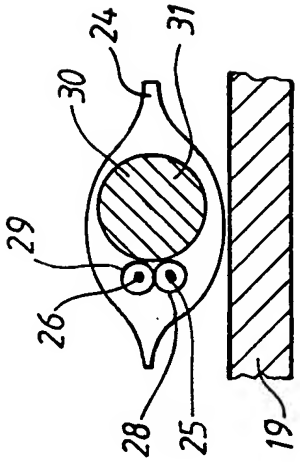

FIG.3

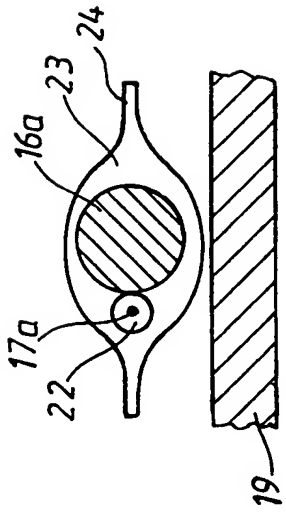

FIG.2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 98/00126

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A47L 9/00, A47L 9/24, A47L 9/28
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: A47L, F16L, H01B, H02G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0738492 A1 (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD), 23 October 1996 (23.10.96), figures 1-46, abstract ---	1,6
Y	EP 0433774 A1 (PROGRESS ELEKTROGERÄTE GMBH), 26 June 1991 (26.06.91), figures 6,7, details 5,6 --- --------	1,6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
2 April 1998	26 -05- 1998
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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/03/98

International application No.
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